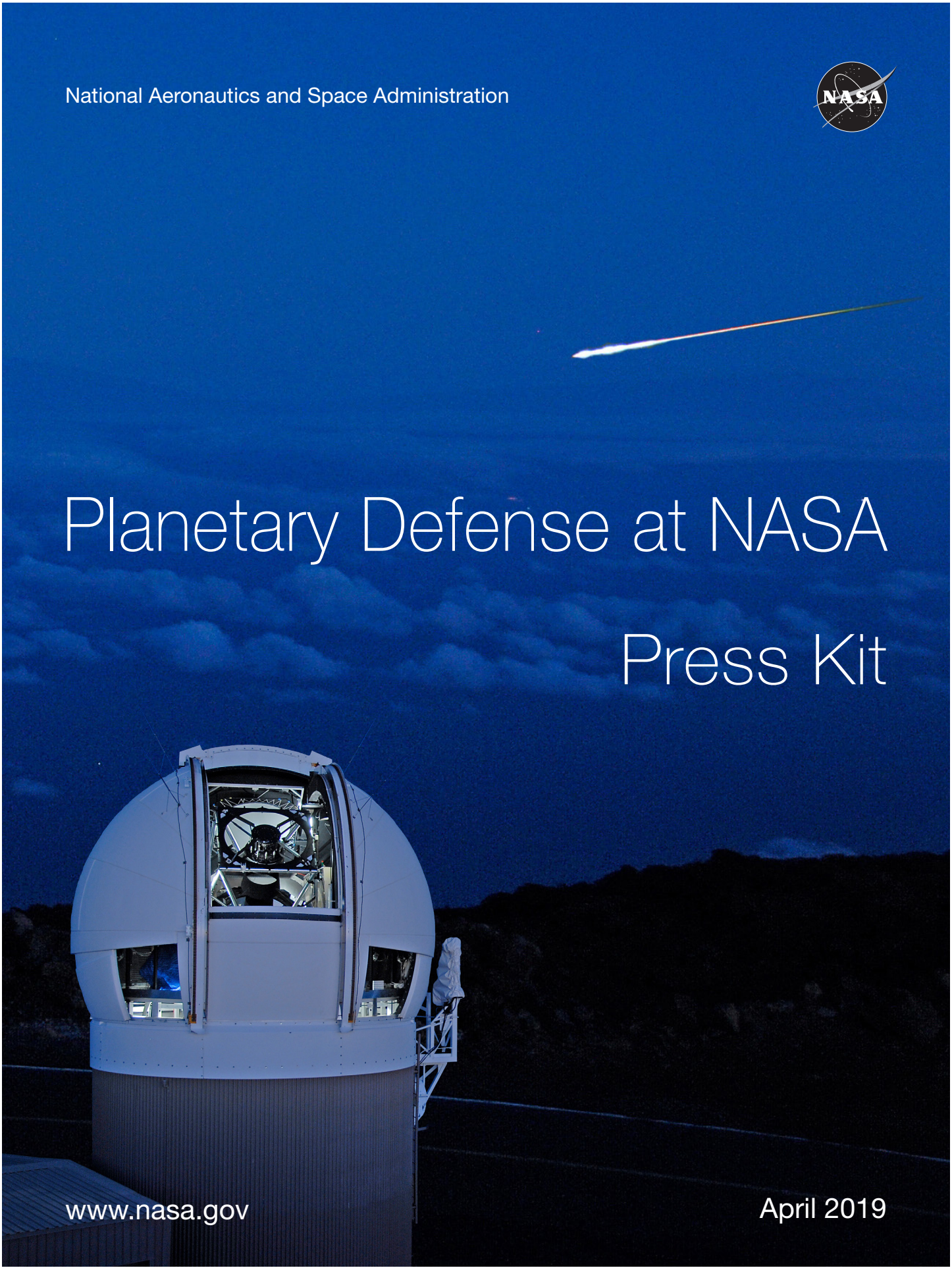
National Aeronautics and Space Administration



Planetary Defense at NASA

Press Kit

www.nasa.gov

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Planetary Defense Coordination Office (PDCO)

Hosted by the Planetary Science Division of the Science Mission Directorate at NASA Headquarters, Washington, DC

PDCO'S ROLE

- Provides early detection of Potentially Hazardous Objects (PHOs)—the subset of Near-Earth Objects (NEOs), both asteroids and comets, whose orbits come within 5 million miles of Earth's orbit; and of a size large enough (larger than 30 to 50 meters) to do damage at Earth's surface;
- Tracks and characterizes PHO's and issues warnings of the possible effects of potential impacts;
- Provides timely and accurate information on PHO's to governments and the public; and
- Leads efforts in coordinating U.S. government planning for response to an actual impact threat.

WHAT IS PLANETARY DEFENSE?

Planetary defense is the term used to encompass all the capabilities needed to detect the possibility and warn of potential asteroid or comet impacts with Earth, and then either prevent them or mitigate their possible effects on Earth. Planetary defense involves:

- Finding and tracking near-Earth objects that pose of hazard of impacting Earth;
- Characterizing those objects to determine their orbit trajectory, size, shape, mass, composition, rotational dynamics and other parameters, so that experts can determine the severity of the potential impact event, warn of its timing and potential effects, and determine the means to mitigate the impact; and
- Planning and implementation of measures to deflect or disrupt an object on an impact course with Earth, or to mitigate the effects of an impact that cannot be prevented. Mitigation measures that can be taken on Earth to protect lives and property include evacuation of the impact area and movement of critical infrastructure.

WHAT IS A NEAR-EARTH OBJECT?

A Near-Earth Object (NEO) is an asteroid or comet whose orbit periodically brings it within approximately 121 million miles (195 million kilometers) of the Sun—that's within about 30 million miles (50 million kilometers), of Earth's orbit.

Like the planets, all asteroids and comets orbit the Sun, although some asteroids are also in orbit about planets or even

larger asteroids. Some of the smaller moons of other planets may be captured asteroids. Most asteroids are in what is called “the main belt” between Mars and Jupiter. The vast majority of near-Earth asteroids have come from the inner part of the main belt where, over tens of millions of years, their orbits were altered by the gravitational influence of Jupiter and Mars, and some by mutual collisions.

Although the vast majority of NEOs that enter Earth’s atmosphere are so small they disintegrate before reaching the surface, those that are larger than around 98 to 164 feet (30 to 50 meters) in size may survive the descent and could cause widespread damage in and around their impact sites.

A BRIEF HISTORY OF NASA’S PLANETARY DEFENSE COORDINATION OFFICE

NASA established the Planetary Defense Coordination Office in January 2016 to coordinate planetary defense efforts across NASA, with other US agencies, and with international partners, and to administer NASA’s Near-Earth Object Observation Program which dates back to 1998. However, NASA has been studying near Earth objects (NEOs) since the 1970s. The agency now participates as a key member in the International Asteroid Warning Network (IAWN), recommended by the United Nations Committee on the Peaceful Uses of Outer Space (UN-COPUOS) as the unified response for all space-capable nations to address the NEO impact hazard. To date, NASA-sponsored NEO surveys have provided 98 percent of all NEO detections.

In 1992, NASA began conducting scientific workshops and research into the identification, characterization, and tracking of NEOs, as well as into potential mitigation strategies. NASA reported that NEOs with a diameter greater than 0.62 miles (1 kilometer) posed the greatest hazard to life on Earth and predicted that an organized survey could identify most NEOs of this size within a decade.

In 1998, Congress directed NASA to find, characterize, and monitor 90 percent of the estimated 2000 asteroids and comets that approach the Earth that are larger than about 1 kilometer (about 2/3-mile) in size. This goal was met in 2011.

In 2005, Congress extended that goal to include 90% of the NEOs larger than 140 meters in size by the end of 2020. A near-by impact of an asteroid this size could devastate a state-wide area. As of November 2018, 8,382 of those NEOs have been found, but this is only one third of the estimated total population of 25,000.

HOW WE SEARCH FOR NEOS

Observers find and track NEOs using ground-based, wide sky survey telescopes around the world, along with contribution from NASA’s space-based NEOWISE telescope. The basic method of finding NEOs is to look for objects moving against the background of

relatively fixed stars. Observers provide their data to a global database maintained by the Minor Planet Center (MPC), which is sanctioned by the International Astronomical Union for world-wide collection of observations and tracking of asteroids and comets, and funded by NASA's NEO Observations Program. The Center of Near-Earth Object Studies (CNEOS) uses the position data reported to the MPC to calculate high precision orbits decades into the future and are tasked with warning PDCO of any potential impacts.

MINOR PLANET CENTER

The Minor Planet Center (MPC) is the internationally recognized public archive of small-body orbit data submitted by observers from around the world. The MPC notifies observers worldwide about NEO discoveries so that timely follow-up observations can be collected for identification and orbit computation. The MPC is sanctioned by the International Astronomical Union and supported by NASA's NEO Observations Program as a subnode of NASA's Planetary Data System Small Bodies Node.
https://www.minorplanetcenter.net/iau/mpc.html

Key Organizations Involved with PDCO

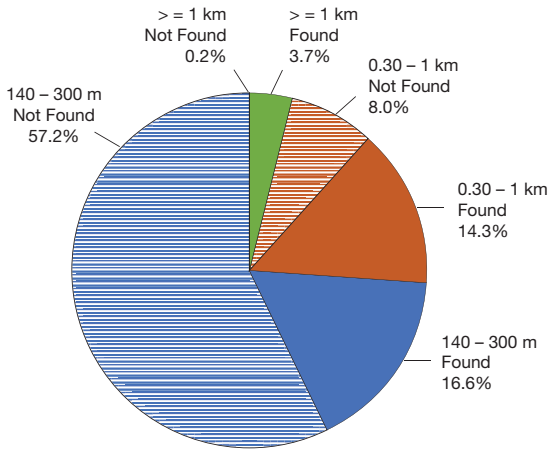
CENTER FOR NEAR-EARTH OBJECTS STUDIES (CNEOS)

The Center for Near-Earth Object Studies (CNEOS) computes high-precision orbit paths for NEOs from positions reported to the Minor Planet Center. CNEOS computes orbits for new asteroid discoveries and performs long-term analyses of possible future positions of hazardous asteroids relative to Earth to determine and warn of any impact hazard. CNEOS computes impact time and location in the event of a predicted impact threat. The Jet Propulsion Laboratory hosts CNEOS for NASA's NEO Observations Program, and its website makes all orbit computation information public.
https://cneos.jpl.nasa.gov/

IAWN—INTERNATIONAL ASTEROID WARNING NETWORK

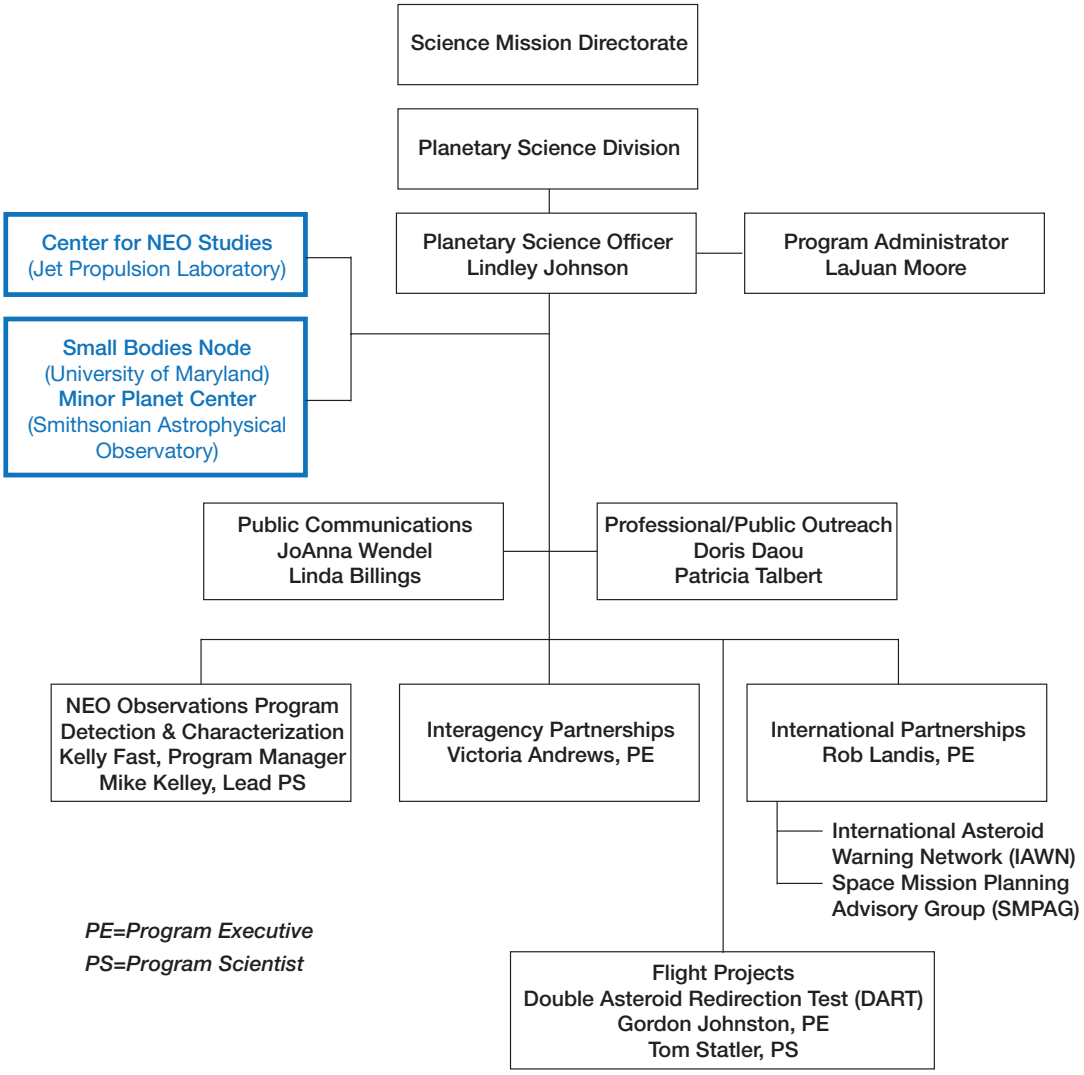
The IAWN was established (in 2013) to foster an international group of astronomy and space institutions involved in exchange of data and information for detecting, tracking, and characterizing NEOs. The IAWN is tasked with developing a strategy using well-defined communication plans and protocols to assist Governments in the analysis of asteroid impact consequences and in the planning of mitigation responses.
http://iawn.net/

NEO Population—140 Meters and Larger



NEO Survey Status Jan 2019

Planetary Defense Coordination Office



Fast Facts


National Aeronautics and Space Administration
PLANETARY DEFENSE
by the numbers
20 YEARS
of NASA's Near-Earth Object Observations Program
19,975
Near-Earth Asteroids Discovered
107
Near-Earth Comets Known
896
Known Near-Earth Asteroids Greater Than 1 Kilometer In Size
8,544
Known Near-Earth Asteroids Greater Than 140 Meters In Size
73
Asteroids Passed Closer Than the Moon in 2018
5
Times Per Year a Small Asteroid Impacts Earth and Releases Greater than 1 Kiloton of Energy
1968
Potentially Hazardous Asteroids in the Catalogue
209 Million
Observations Submitted to the Minor Planet Center
PLANETARY DEFENSE COORDINATION OFFICE
April 2019
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www.nasa.gov/planetarydefense
cneos.jpl.nasa.gov
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NASA EXPLORES